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(54) **COMPOSITE ARTICLES INCLUDING A FLUOROPOLYMER**

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(56) **References Cited**

**U.S. PATENT DOCUMENTS**

3,655,727 A	4/1972	Patel et al.	260/470 P
3,686,143 A	8/1972	Bowman	260/47 UP
3,712,877 A	1/1973	Patel et al.	260/87.7
3,857,807 A	12/1974	Kometani et al.	260/29.6 F
3,876,654 A	4/1975	Pattison	260/30.4 R
3,933,732 A	1/1976	Schmiegel	260/42.27
4,233,421 A	11/1980	Worm	525/343
4,259,463 A	3/1981	Moggi et al.	525/331
4,335,238 A	6/1982	Moore et al.	526/254
4,501,858 A	2/1985	Moggi	525/340
4,673,715 A	6/1987	Caywood	525/340
4,748,208 A	5/1988	Kasahara et al.	525/151
4,833,212 A	5/1989	Yamada et al.	525/359.2
4,882,390 A	11/1989	Grootaert et al.	525/326.3

4,933,090 A	6/1990	Gill et al.	210/700
5,319,025 A	6/1994	Weigelt	
5,383,087 A	1/1995	Noone et al.	
5,399,434 A	3/1995	Katz et al.	428/421
5,552,199 A	9/1996	Blong et al.	428/36.9
5,566,720 A	10/1996	Cheney et al.	
5,658,670 A	8/1997	Fukushi et al.	428/421
5,792,532 A	8/1998	Pfleger	
5,804,670 A	9/1998	Stoepelmann	
6,096,428 A	8/2000	Jing et al.	428/421
6,156,400 A	12/2000	Jing et al.	428/35.7

**FOREIGN PATENT DOCUMENTS**

EP	0 739 712 A2	10/1996
WO	WO 93/01493	1/1993
WO	WO 93/14933	8/1993
WO	WO 99/00249	1/1999
WO	WO 99/32557	7/1999

**OTHER PUBLICATIONS**

F. W. Billmeyer, *Textbook of Polymer Science*, 3<sup>rd</sup> ed., pp. 398–403, John Wiley & Sons, New York (1984).  
R. A. Brullo, "Fluoroelastomer Rubber for Automotive Applications", *Automotive Elastomer & Design*, Jun. 1985.  
R. A. Brullo, "Fluoroelastomer Seal Up Automotive Future", *Materials Engineering*, Oct., 1988.  
W. M. Grootaert et al., "Fluorocarbon Elastomers", Kirk-Othmer, *Encyclopedia of Chemical Technology*, vol. 8, pp. 990–1005 (4<sup>th</sup> ed., John Wiley & Sons, 1993).  
"Organic Fluorine Compounds", Kirk-Othmer, *Encyclopedia of Chemical Technology*, vol. 11, pp. 20, 21, 32, 33, 40, 41, 50, 52, 62, 70, 71 (John Wiley & Sons, 1980).  
West, A.C. & Holcomb, A.G. "Fluorinated Elastomers", Kirk-Othmer, *Encyclopedia of Chemical Technology*, vol. 8, 3<sup>rd</sup> ed., John Wiley & Sons, Inc., pp. 500–515 (1979).

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(57) **ABSTRACT**

A composite article is provided which includes a fluoropolymer intimately bonded to a component including a substantially non-fluorinated thermoplastic having pendant phenolic groups in combination with a base. Increased adhesion is observed by a greater peel strength value between the fluoropolymer component and a non-fluorinated thermoplastic having pendant phenolic groups.

**48 Claims, No Drawings**